Economic Returns Due to Alfalfa Cultivar Selection Over 30 of Testing in CA Environments

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What is an alfalfa variety?

A population of plants consisting of genetically diverse individuals that have been selected for improved traits:

- yield,
- fall dormancy,
- forage quality,
- persistence,
- disease and insect resistance;

Considerable plant-to-plant variation, Multiple genotypes = Major asset = great adaptation

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Resistance Abbreviations		Percent resistance[1]
HR	Highly Resistant	>51%
R	Resistant	31-50%
MR	Moderate Resistant	15-30%
LR	Low Resistant	6-14%
S	Susceptible	<5%
T	Tolerance	--

[1] Percent of plants in a population resistant to a given pest

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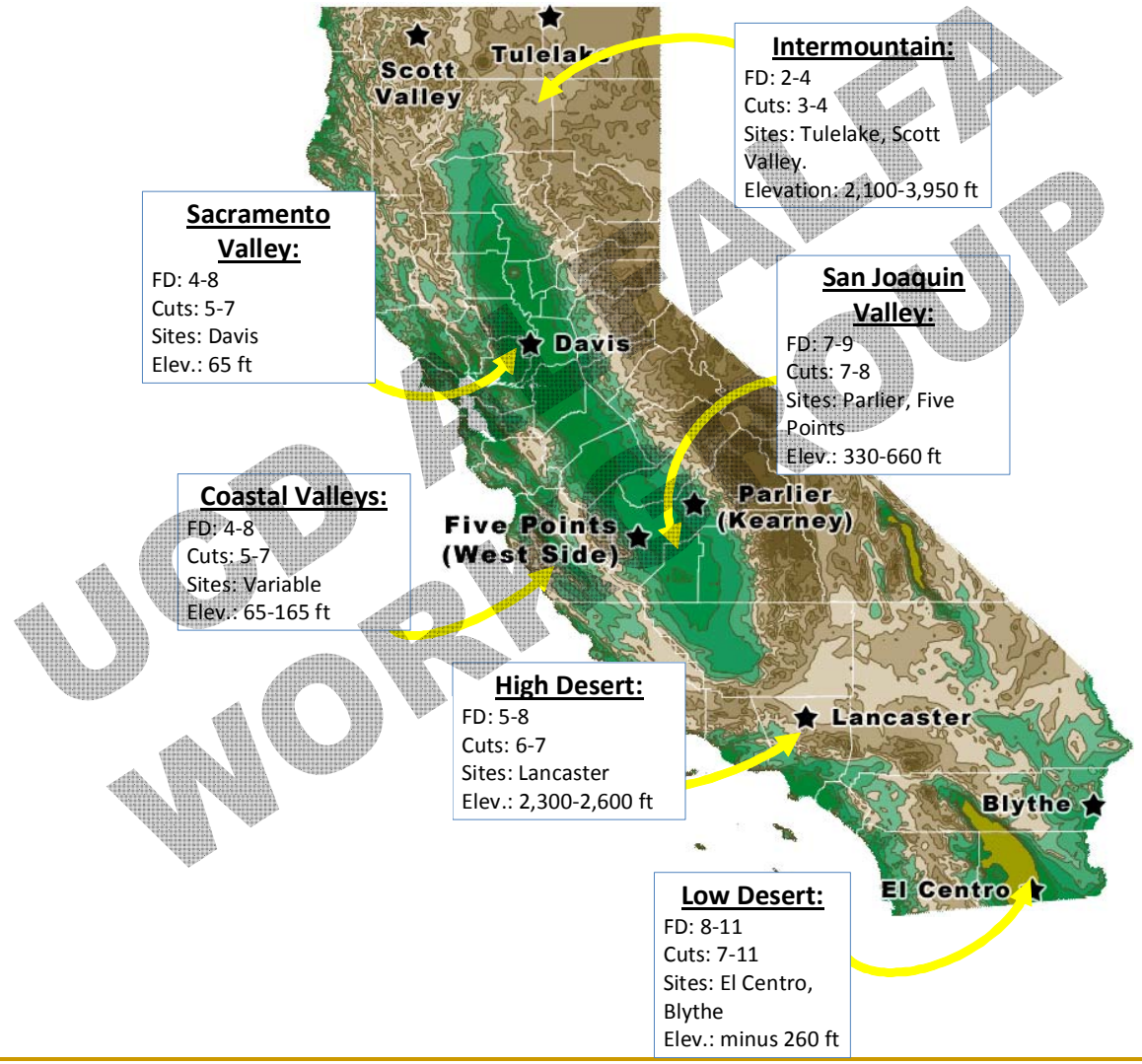
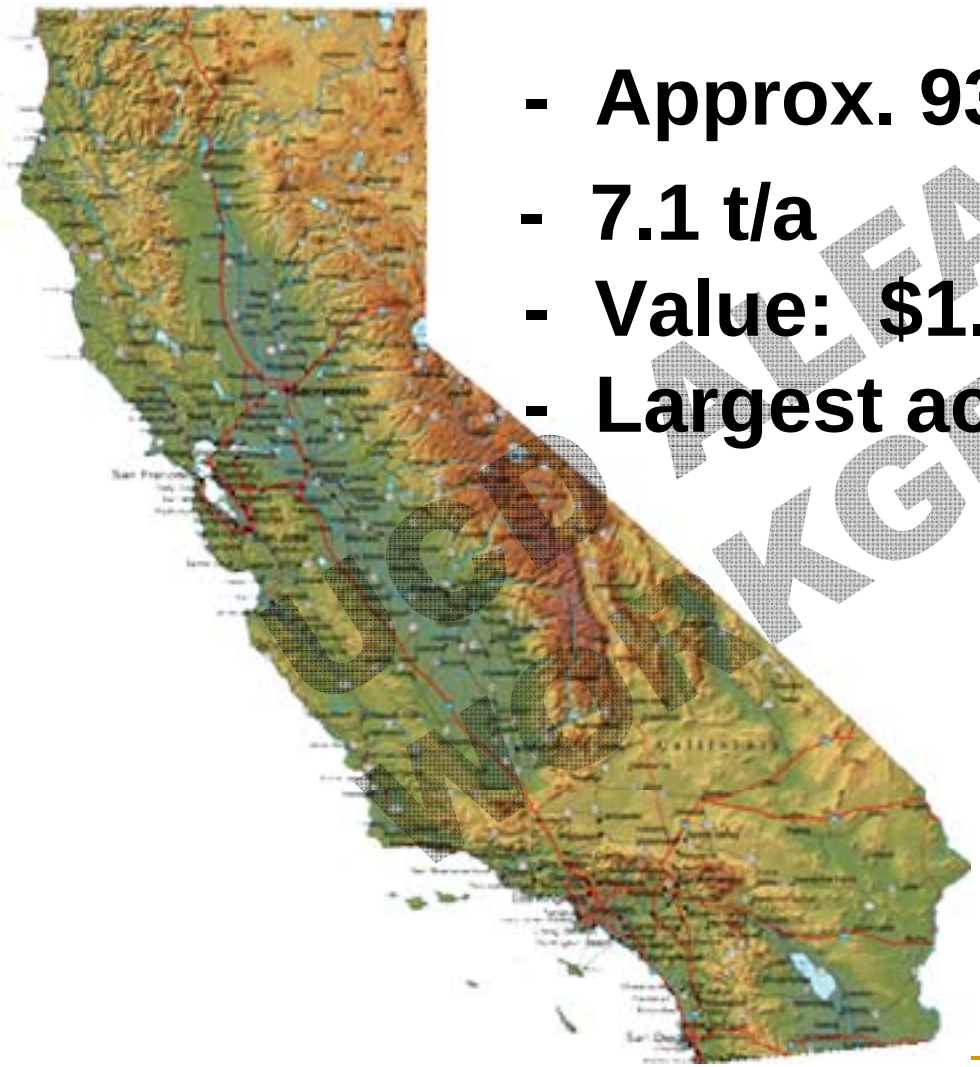
Locations used for the UC alfalfa cultivar testing program



Total California Alfalfa Production



- Approx. 930,000 acres
- 7.1 t/a
- Value: $1.17 Billion
- Largest acreage crop in CA

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Why look at variety trials?

"ASS,U,ME"

- Scientific approach – follows protocols;
- Decades of breeding for pest-resistant, high-yielding and high-quality alfalfa;
- Losses are seldom recognized;
- Primary step in IPM – cost effective;
- Measure for dealing with insects and diseases.

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VARIETY SELECTION SETS THE UPPER LIMIT OF YIELD & PERFORMANCE

However…

- Some growers still don't take sufficient time to compare varieties
- And simply favor inexpensive seed…

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Economic Analysis

- Enables a more rational approach to the value of variety data to guide cultivar selection

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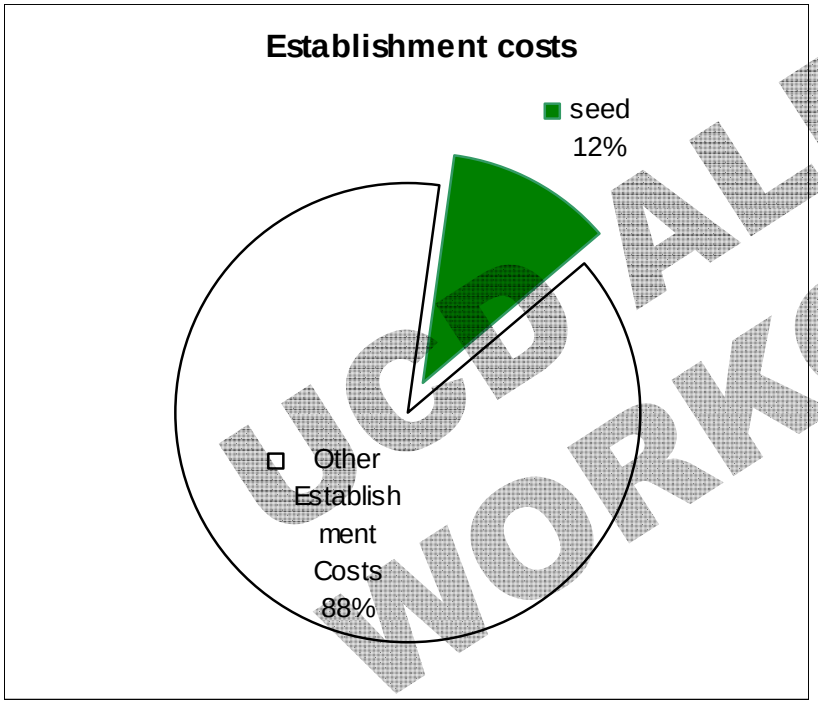
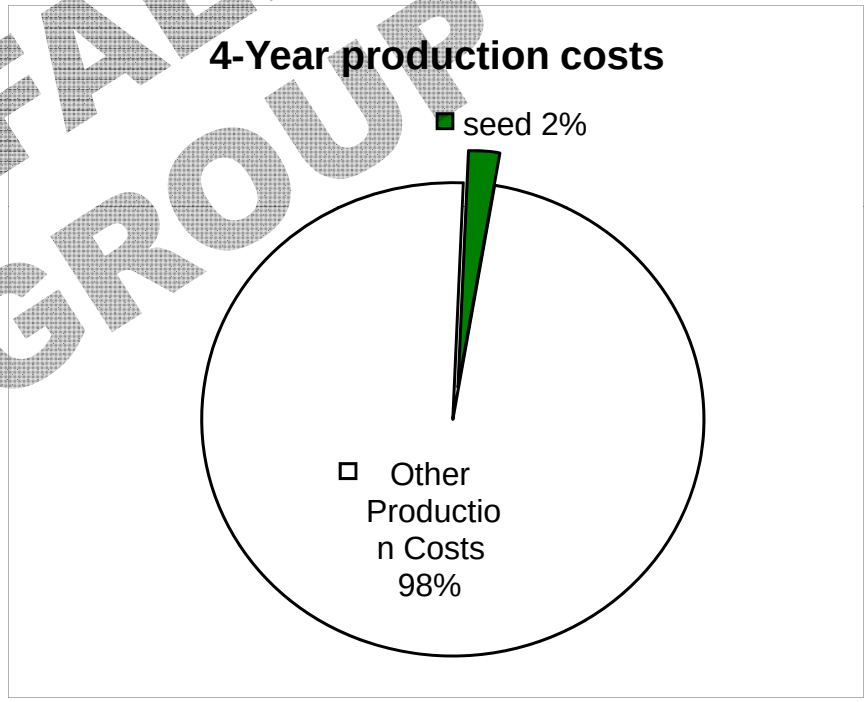
Seed costs as a percentage of production





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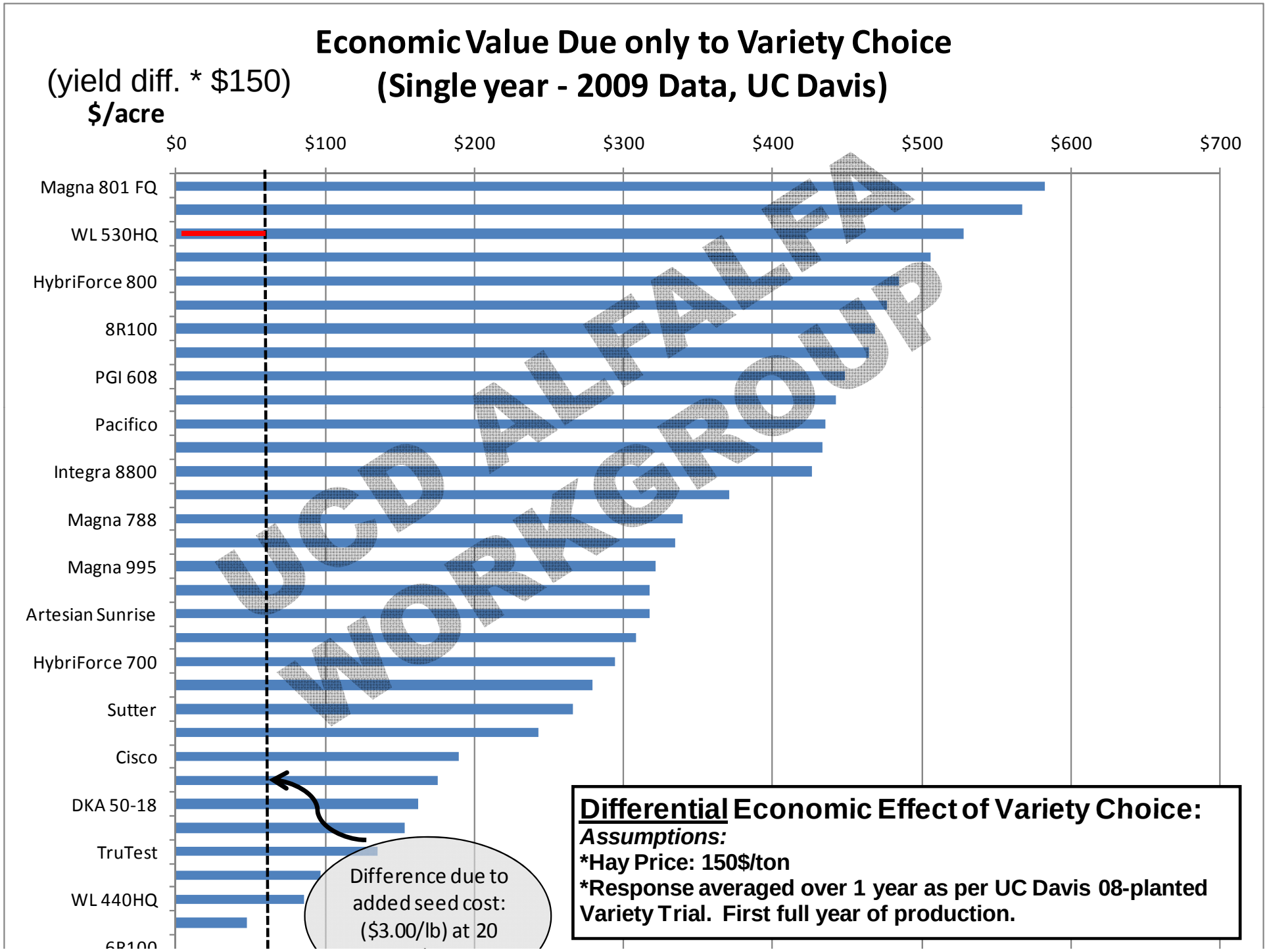
Economic Value Due only to Variety Choice
(Single year - 2009 Data, UC Davis)
(yield diff. * $150)
$/acre
$0
$100
$200
$300
$400
$500
$600
$700
Magna 801 FQ
WL 530HQ
HybriForce 800
8R100
PGI 608
Pacifico
Integra 8800
Magna 788
Magna 995
Artesian Sunrise
HybriForce 700
Sutter
Cisco
DKA 50-18
TruTest
WL 440HQ
6R100
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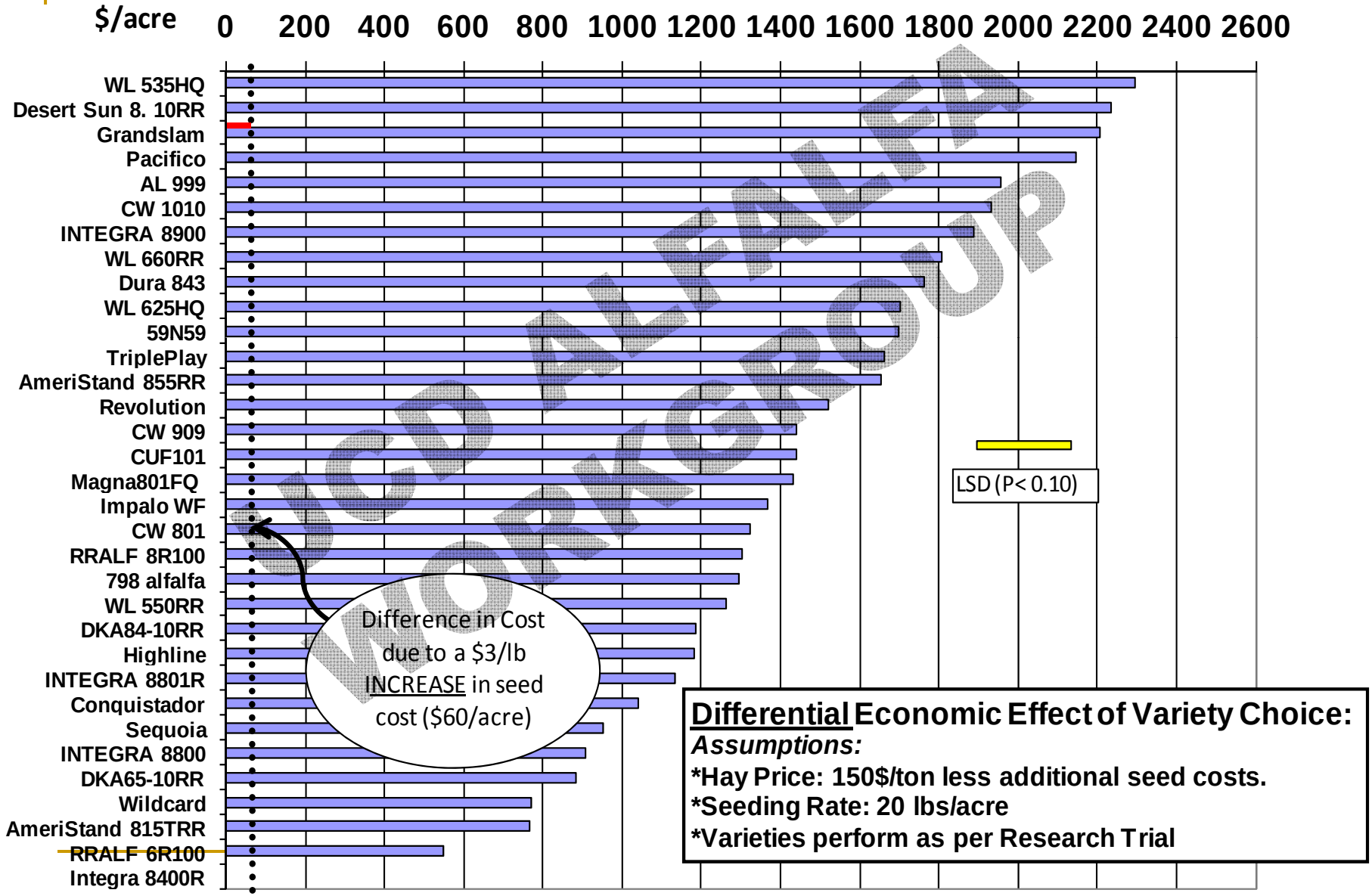
Difference due to added seed cost: ($3.00/lb) at 20
Differential Economic Effect of Variety Choice:
Assumptions:
*Hay Price: 150$/ton
*Response averaged over 1 year as per UC Davis 08-planted Variety Trial. First full year of production.

Economic Value Due only to Variety Choice
(Three Year - Fresno County West Side Data, 2007-2009)



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THE VALUE OF IMPROVED VARIETIES ALMOST ALWAYS EXCEEDS DIFFERENCES IN SEED COSTS

Economic consequences of choosing varieties

	Choice of Variety		
	High Yielding Variety (Seed A)	Medium Yielding Variety (Seed B)	Low Yielding Variety (Seed C)
Seed price ($/Lb)	3.50	2.50	1.50
Potential yield (ton/A/yr)	12.8	11.6	10.9
Seed cost ($/A)	87.50	62.50	37.50

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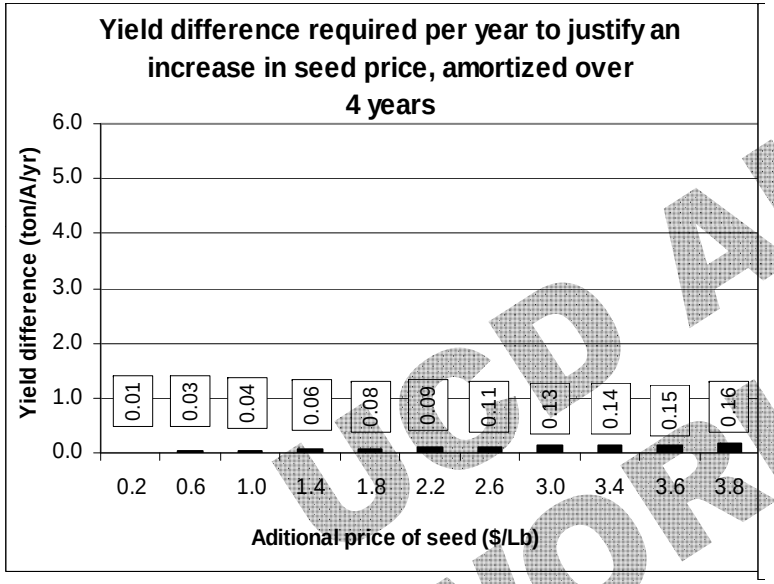

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How much more would you pay to have a variety that produces an extra ton/A/yr?

- If a Seed A produces 1 ton/A/yr more than Seed B, then it would be feasible to pay up to $24/Lb more for Seed A;

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[1 ton = $150 = $600 (4 years): $600/25Lb = $24/Lb]

*Seeding rate of 25Lb/A

What is the actual economic value of improved varieties?

…it's difficult to measure directly!

Limitations:

- **Transferability of Data -** Degree to which yield performance in trials match farmer's fields
- **Adaptation Rate -** Extent to which farmers and seed companies choose varieties based upon this information
- **Value of Yield vs. Other Traits -** The relationship of yield to other valuable attributes (e.g. resistance to disease and insects, forage quality, persistence, salt tolerance, herbicide tolerance). Improved varieties may have other benefits besides simply yield
- **Masking of Genetic Potential** with other practices, such as suboptimum cutting schedules, pest management, fertility practices which limit the genetic advantages of better varieties

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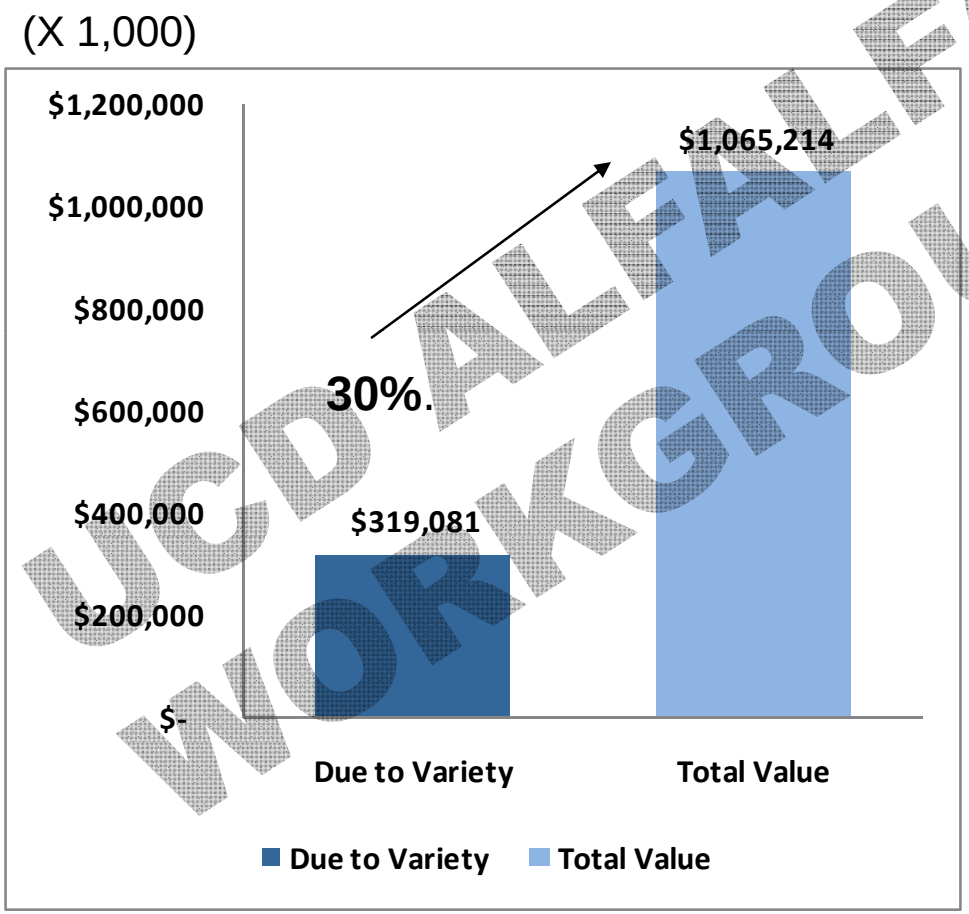
Total Annual Gross Economic Value and value potentially due to variety



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(Normalized to 2009 dollars, averaged over 30 years of California production)

Summation Data from Multiple Trials

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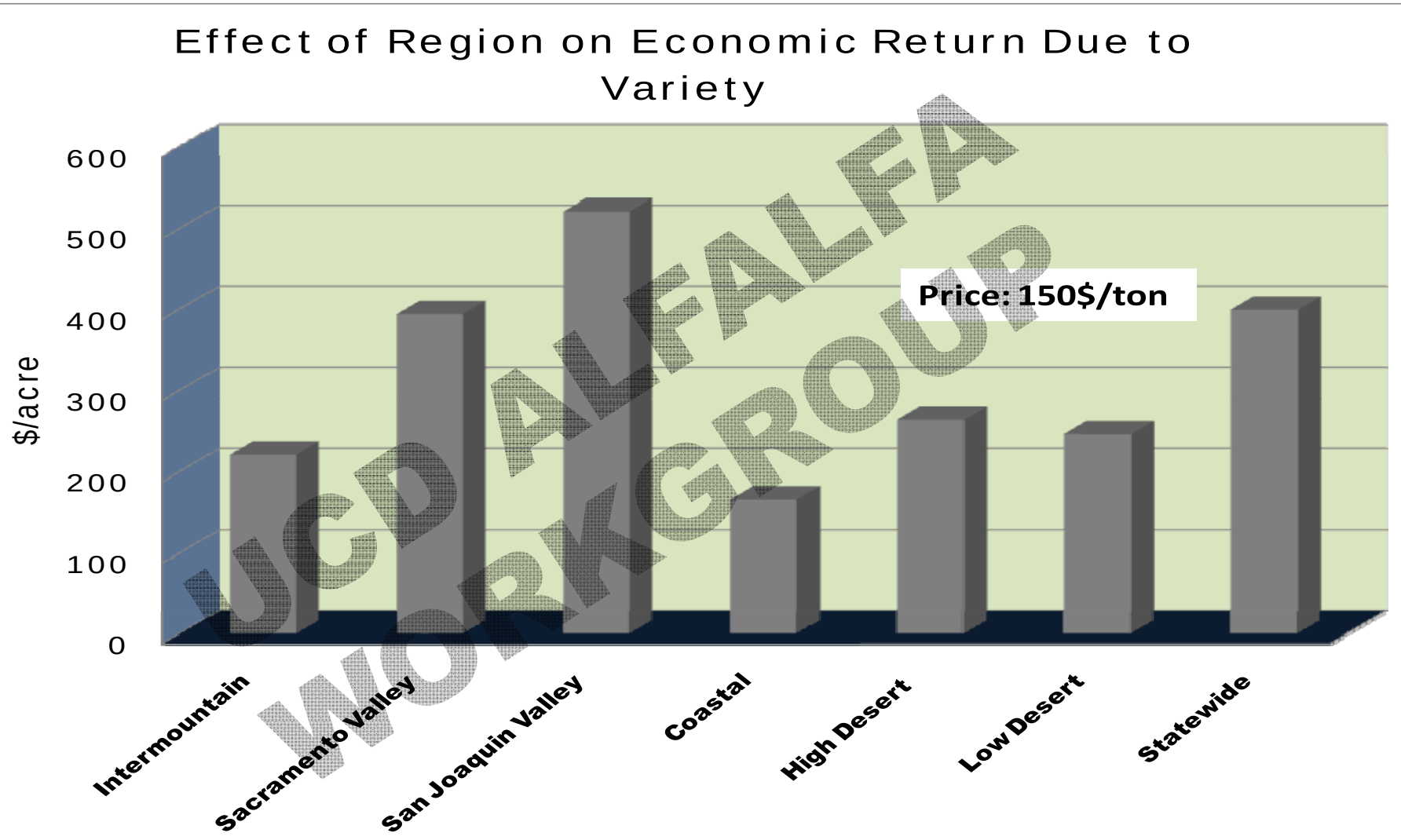
Region	Number of Trials	Harvests Per year	Duration of Testing	Total Number of Harvests	Average Trial Yield	Average Yield Difference Due to Variety	Regional Contribution to CA Production	Potential Yield Difference Due to Variety
	(N)	Cuts	Years	(N)	t/a	t/a	%	%
Intermountain	32	3 to 4	128	379	6.2	1.5	10%	23.9%
Sacramento Valley	27	5 to 7	87	498	9.3	2.6	14%	28.4%
San Joaquin Valley	25	7 to 8	86	556	10.1	3.5	54%	34.3%
Coastal	4	4 to 5	9	38	4.0	1.1	1%	27.4%
High Desert	4	6 to 7	12	78	9.2	1.8	2%	19.1%
Low Desert	21	8 to 11	56	356	7.8	1.6	20%	21.0%
Statewide	**113**	**6 to 7**	**378**	**1905**	**8.9**	**2.7**	**100%**	30.0%


Effect of Region on Economic Return Due to Variety
$/acre
600
500
400
300
200
100
0
Price: 150$/ton
Intermountain
Sacramento Valley
San Joaquin Valley
Coastal
High Desert
Low Desert
Statewide
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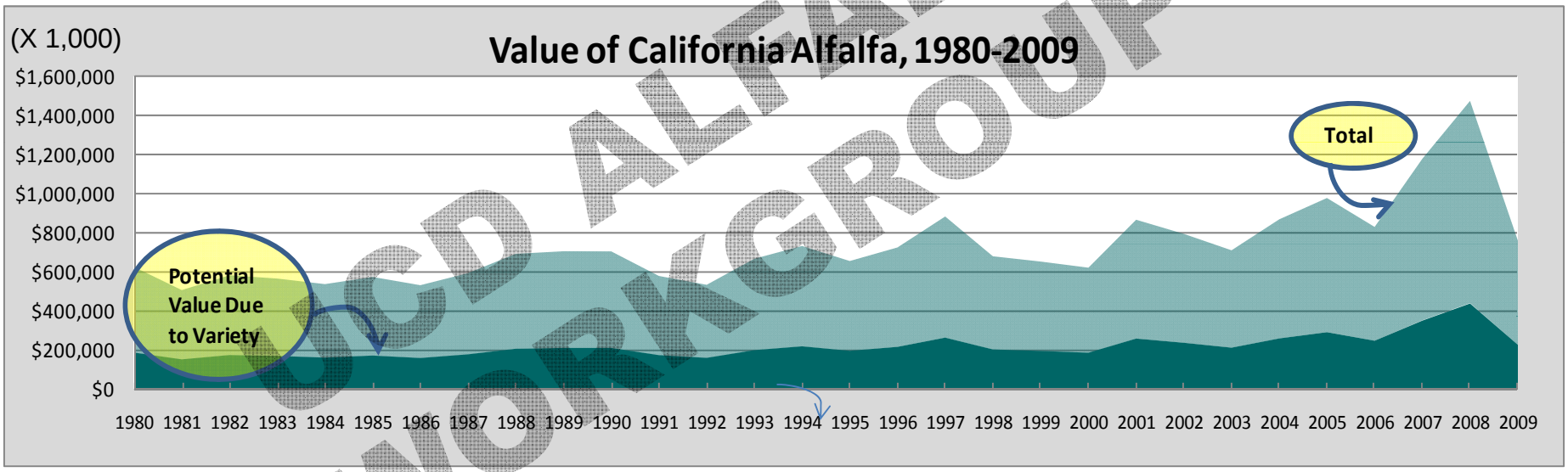
Total value and the value potentially due to variety, over 30 years in California.



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CONCLUSIONS

- Potential yield increases due to variety choice are economically significant for farmers;
- This value easily exceeds differences in seed costs, especially over years;

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CONCLUSIONS

- Avg. yield differences due to variety, as measured in 378 location/yrs in CA field trials was 2.7 ton/a/yr, or approx. 30% of the mean values;
- Yield differences due to variety were greater in some regions than others.

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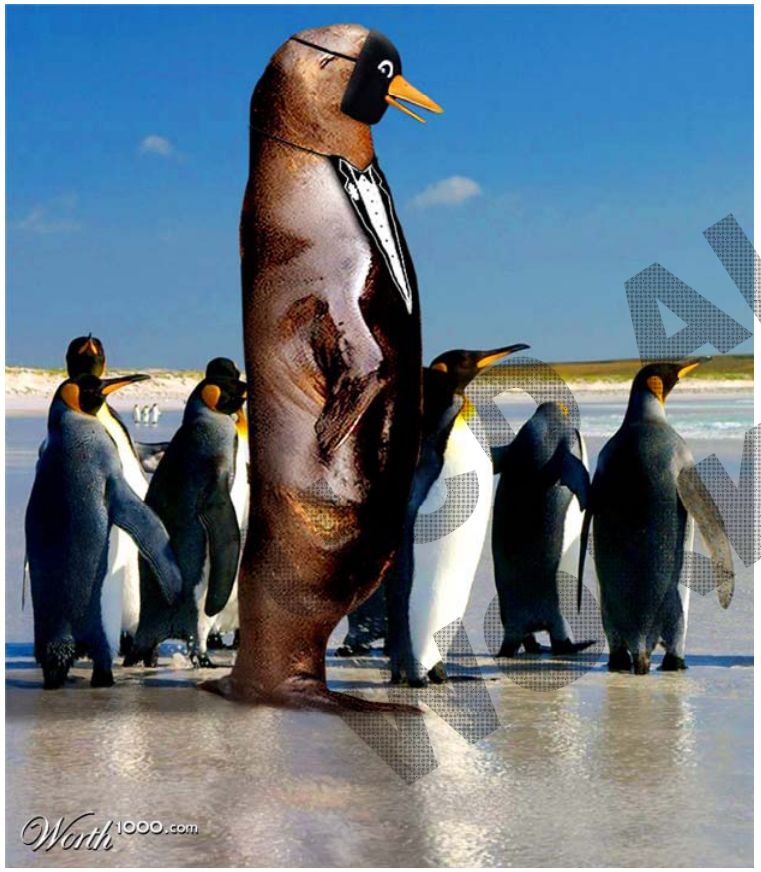
CONCLUSIONS



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- Thank you for your attention!
  - Questions/Comments?

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Assumptions for these Calculations:

- Potential yield differences are similar to those measured in 378 trial years of UC variety tests, as a percent of average value
- Economic value due to yield alone, not other genetic traits
- Does not consider yield effects on supply-demand curves, or the effects of forage quality on price and the yield-quality tradeoff
- This is a description of the maximum effects on economic returns due to variety.

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